PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Migaku TAKAHASHI et al.

Box Non-fee Amendment

Serial No. (unknown)

GROUP

Filed herewith

Examiner

MAGNETIC RECORDING MEDIUM AND PRODUCTION METHOD THEREOF AND MAGNETIC RECORDING DEVICE

PRELIMINARY AMENDMENT

Commissioner for Patents

Washington, D.C. 20231

Sir:

Prior to the first Official Action and calculation of the filing fee, please amend the above-identified application as follows:

IN THE CLAIMS:

Please amend claims 3-6, 9-10, 12 and 16-17 as follows:

--3. (Amended) A magnetic recording medium according to claim 1, wherein said metal underlayer incorporates an underfilm of either one of Cr and a Cr alloy, and said Cr alloy also incorporates Mo and/or W.

4. (Amended) A magnetic recording medium according to claim 1, wherein said metal underlayer incorporates an underfilm of either one of Cr and a Cr alloy, and said Cr alloy incorporates one, or two or more elements selected from a group consisting of V, Nb, Hf, Zr, Ti, Mn, Ta, Ru, Re, Os, Ir, Rh, Pd, Pt, P, B, Si, Ge, N and O.

5.(Amended) A magnetic recording medium according to any one of claim 1 , wherein a film thickness of said metal underlayer is within a range from 3 nm to 20 nm.

6.(Amended) A magnetic recording medium according to claim 1, wherein said metal underlayer comprises a layered structure of two or more underfilms with different lattice constants.

9.(Amended) A magnetic recording medium according to claim 7, wherein a film thickness of said second underfilm is within a range from 1.5 nm to 8.5 nm.

10.(Amended) A magnetic recording medium according to claim 1, wherein a lattice misfit of said metal underlayer and said ferromagnetic metal layer, as determined by an equation $(y-x) / (x/2 + y/2) \cdot 100(\%)$, in which x represents a length obtained by multiplying by Ö2 a lattice constant of said metal underlayer and y represents a c axis length of a crystal lattice of said ferromagnetic metal layer, is a value from 0.5% to 2.5%.

12.(Amended) A magnetic recording medium according to claim 1, wherein in a crystal lattice of said ferromagnetic metal layer of said cobalt based alloy, an interatomic distance a in a direction of a normal line to said ferromagnetic metal layer is larger than an interatomic distance b in a direction within a plane of said ferromagnetic metal layer.

16.(Amended) A method of producing a magnetic recording medium according to claim 14, wherein in order to control said lattice misfit, either one of a positive and a negative bias of 0 V to 300 V is applied to said base material during film fabrication of said ferromagnetic metal layer.

17.(Amended) A magnetic recording device comprising a magnetic recording medium according to claim 1, a drive section for driving said magnetic recording medium, and a magnetic head for carrying out recording and playback of magnetic information, wherein said magnetic head performs recording and playback of magnetic information on a moving said magnetic recording medium.--

ADD NEW CLAIMS 18-20:

--18.(New) A method of producing a magnetic recording medium according to claim 15, wherein in order to control said lattice misfit, either one of a positive and a negative bias of 0 V to 300 V is applied to said base material during film fabrication of said ferromagnetic metal layer.--

--19.(New) A magnetic recording medium according to any one of claim 2, wherein said metal underlayer comprises a layered structure of two or more underfilms with different lattice constants.--

--20.(New) A magnetic recording medium according to claim 3, wherein said metal underlayer comprises a layered structure of two or more underfilms with different lattice constants.--

IN THE ABSTRACT:

Cancel the abstract as originally filed which appears on page 57. Add new abstract as enclosed herewith on a separate sheet.

REMARKS

Claims 3-6, 9-10, 12 and 16-17 were amended to correct multiple dependency. Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned **"VERSION WITH MARKINGS TO SHOW CHANGES MADE"**.

Respectfully submitted,

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"VERSION WITH MARKINGS TO SHOW CHANGE MADE"

Claims 3-6, 9-10, 12 and 16-17 have been amended as follows:

3. (Amended) A magnetic recording medium according to ~~either one of~~ claim 1, wherein said metal underlayer incorporates an underfilm of either one of Cr and a Cr alloy, and said Cr alloy also incorporates Mo and/or W.

4. (Amended) A magnetic recording medium according to ~~either one of~~ claim 1, wherein said metal underlayer incorporates an underfilm of either one of Cr and a Cr alloy, and said Cr alloy incorporates one, or two or more elements selected from a group consisting of V, Nb, Hf, Zr, Ti, Mn, Ta, Ru, Re, Os, Ir, Rh, Pd, Pt, P, B, Si, Ge, N and O.

5. (Amended) A magnetic recording medium according to any one of claim 1 , wherein a film thickness of said metal underlayer is within a range from 3 nm to 20 nm.

6. (Amended) A magnetic recording medium according to ~~any one of claim 1 through claim 5,~~ claim 1, wherein said metal underlayer comprises a layered structure of two or more underfilms with different lattice constants.

9. (Amended) A magnetic recording medium according to ~~either one of~~ claim 7, wherein a film thickness of said second underfilm is within a range from 1.5 nm to 8.5 nm.

10. (Amended) A magnetic recording medium according to ~~any one of~~ claim 1, wherein a lattice misfit of said metal underlayer and said ferromagnetic metal layer, as determined by an equation $(y-x) / (x/2 + y/2) \cdot 100(\%)$, in which x represents a length obtained by multiplying by Ö2 a lattice constant of said metal underlayer and y represents a c axis length of a crystal lattice of said ferromagnetic metal layer, is a value from 0.5% to 2.5%.

12. (Amended) A magnetic recording medium according to ~~any one of~~ claim 1, wherein in a crystal lattice of said ferromagnetic metal layer of said cobalt based alloy, an interatomic distance a in a direction of a normal line to said ferromagnetic metal layer is larger than an interatomic distance b in a direction within a plane of said ferromagnetic metal layer.

16. (Amended) A method of producing a magnetic recording medium according to ~~either one of claim 14 and claim 15, claim 14~~, wherein in order to control said lattice misfit, either one of a positive and a negative bias of 0 V to 300 V is applied to said base material during film fabrication of said ferromagnetic metal layer.

17. (Amended) A magnetic recording device comprising a magnetic recording medium according to ~~any one of~~ claim 1 ~~through claim 13~~, a drive section for driving said magnetic recording medium, and a magnetic head for carrying out recording and playback of magnetic information, wherein said

magnetic head performs recording and playback of magnetic information on a moving said magnetic recording medium.

The abstract has been amended as follows:

ABSTRACT OF THE DISCLOSURE

~~The present invention provides a~~A magnetic recording medium ~~with~~was a high normalized coercive force and superior thermal~~stability, as well as a method of producing such a magnetic recording medium and a magnetic recording device incorporating such a magnetic recording medium. A magnetic recording medium according to the present invention~~stability. The magnetic recording medium comprises a non-magnetic base material, and a ferromagnetic metal layer of cobalt based alloy formed on top of this base material with a metal underlayer disposed therebetween, and displays a coercive force Hc of at least 2000 (Oe) and an anisotropic magnetic field Hk^{grain} of at least 10,000 (Oe). Furthermore, magnetic recording media in which the aforementioned metal underlayer and/or the ferromagnetic metal layer are fabricated in a film fabrication chamber with an ultimate vacuum at the 10^{-9} Torr level are ~~preferred.~~

~~A~~preferred. A magnetic recording medium according to the present invention can be ideally applied to hard disks, floppy disks, and magnetic tapes and the like.

ABSTRACT OF THE DISCLOSURE

A magnetic recording medium was a high normalized coercive force and superior thermal stability. The magnetic recording medium comprises a non-magnetic base material, and a ferromagnetic metal layer of cobalt based alloy formed on top of this base material with a metal underlayer disposed therebetween, and displays a coercive force Hc of at least 2000 (Oe) and an anisotropic magnetic field Hk^{grain} of at least 10,000 (Oe). Furthermore, magnetic recording media in which the aforementioned metal underlayer and/or the ferromagnetic metal layer are fabricated in a film fabrication chamber with an ultimate vacuum at the 10^{-9} Torr level are preferred. A magnetic recording medium according to the present invention can be ideally applied to hard disks, floppy disks, and magnetic tapes and the like.